



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/796,146

03/10/2004

Mizuhisa Nihei

040102

2043

23850

7590

05/31/2006

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP
1725 K STREET, NW
SUITE 1000
WASHINGTON, DC 20006

EXAMINER

BLUM, DAVID S

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 05/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/796,146

Applicant(s)

NIHEI ET AL.

Examiner

David S. Blum

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 11-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-7 and 10 is/are rejected.
- 7) ☒ Claim(s) 4, 8 and 9 is/are objected to.
- 8) ☒ Claim(s) 1-29 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/10/04</u> . | 6) <input type="checkbox"/> Other: _____ |

This action is in response to the election filed 2/6/06.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-10 in the election filed 2/6/06 is acknowledged.
2. Claims 11-29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as claims 13-29 being drawn to a nonelected invention and claims 11-12 as being drawn to a non elected species, there being no allowable generic or linking claim. Election was made **without** traverse in the election filed 2/6/06.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2 and 5-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Iwasaki (US006278231B1).

Iwasaki teaches the device of claims 1-2 and 5-7 as follows.

Regarding claim 1, Iwasaki teaches a SiC substrate (column 9 lines 64-65), a heat conductor formed in the hole in the SiC substrate and made of linear carbon (column 4 lines 48-52 and column 10 lines 14-15). Iwasaki does not refer to the device as a heat

Art Unit: 2813

conductor, but as the structure is the same of the instant claim, the device would function as in the instant claim.

Regarding claim 2, a film is formed on the SiC substrate (column 4 lines 9-10) and an electrode is formed in the hole and directly connected to the heat conductor (column 4 lines 51-52).

Regarding claim 5, a protective film is formed between the SiC substrate and the film (underlying layer (column 20 lines 57-60).

Regarding claim 6, a lattice constant of the protective film is a value between that of the SiC film and the film (column 20 lines 55-65, the underlying film may be similar to that of the film, thus the lattice constant would be close, and between that of the film and the SiC substrate.

Regarding claim 7, Iwasaki teaches a SiC substrate (column 9 lines 64-65), heat conductors formed in the hole in the SiC substrate and made of linear carbon (column 4 lines 48-52 and column 10 lines 14-15). Iwasaki does not refer to the device as a heat conductor, but as the structure is the same of the instant claim, the device would function as in the instant claim. See figure 11 for spaced apart holes at intervals.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki (US006278231B1) in view of Sung (US 20060091532A1).

Iwasaki teaches the device of claim 3 as recited above in regard to claim 2, except for the lower layer of the electrode being a titanium layer, and the device of claim 10 except for an element on the opposite side of the SiC substrate.

Regarding claim 3, Iwasaki teaches a stack of metals in the hole. Sung teaches using a base layer of titanium as the carbon former for improved thermal properties (paragraph 0063).

Regarding claim 10, Iwasaki teaches a SiC substrate (column 9 lines 64-65), heat conductors formed in the hole in the SiC substrate and made of linear carbon (column 4 lines 48-52 and column 10 lines 14-15). Iwasaki does not refer to the device as a heat conductor, but as the structure is the same of the instant claim, the device would function as in the instant claim. See figure 21 for a second (multiple) heat conductors covering the entire surface of the SiC substrate. Iwasaki is silent as to the placement of

Art Unit: 2813

an element although it is clear an element is placed on a surface to complete the electron emitting device and the surface covered with the carbon and metal filled nano-holes does not exhibit space for such a device. Sung shows the element on a surface not of the heat conductive conductors.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Iwasaki by using a base layer of titanium as the carbon former for improved thermal properties (paragraph 0063) as taught by Sung and placing an element on a surface other than that of the heat conductive conductors as taught by Sung and suggested by Iwasaki as the surface covered with the carbon and metal filled nano-holes does not exhibit space for such a device.

Allowable Subject Matter

7. Claims 4, 8, and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 4 limits the device to having an entire surface of the device opposite the film covered with an electrically conductive film connected to the electrode. Iwasaki (US006278231B1) does not teach such a film. Sung (US 20060091532A1) and

Art Unit: 2813

Kusunoki (US006303094B1) also do not teach a conductive film covering the entire surface opposite the film and connected to the electrode.

Claim 8 limits the device to having a distance from the other surface of the SiC substrate to an upper surface of the second heat conductor being longer than a distance of the other surface of the SiC substrate to an upper surface of the first heat conductor. Iwasaki (US006278231B1) does not teach this, as the heat conductors are all uniform. Sung (US 20060091532A1) and Kusunoki (US006303094B1) also do not teach this, as the heat conductors are all uniform.

Claim 9 limits the device to having a HEMT as the element and at least part of the second heat conductor is located between a gate electrode and a drain electrode when viewed from above. Iwasaki (US006278231B1) does not teach such an element. Sung (US 20060091532A1) and Kusunoki (US006303094B1) also do not teach this element.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David S. Blum

May 30, 2006